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Examining Illness Invalidation and Illness Perception in Relation to Physical Functioning in
the Context of Cardiovascular Disease

A Thesis
Presented to
The Faculty of the Department of Psychology
University of South Carolina Aiken

In Partial Fulfillment
of the Requirements for the Degree
Master of Science

By
Jaclyn Ciera Turner
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Abstract

Invalidation is defined as the perception of cognitive, affective, and behavioral responses of others that are experienced as denying, lecturing, overprotecting, not supporting, and not acknowledging with the respect to the condition of the patient (Kool, 2012). Invalidation has also been suggested to negatively impact patients' physical health (Kool, 2012). One specific type of invalidation is illness invalidation (II), defined as attitudes of distrust, suspicion, lack of support for, or acknowledgement that a patient is suffering from an illness (Blom et al., 2011). In addition to II, illness perception (IP) is another construct that has been linked to negative physical health (Arran, Carufurd, & Simpson, 2013). IP is a process through which an individual constructs a cognitive representation of an illness and has also been shown to influence symptom severity and physical functioning (Arran et al., 2013). Although the relationships between II, IP, and physical health have been observed previously, more extensive research is needed to determine the specific mechanisms of these relationships and what other psychological factors may play a role. Previous studies indicate that coping behaviors and depressive symptoms may be factors that influence these relationships (Shen, McCreay, & Myers, 2003). The present study used a regression analysis to reveal that depression was the only significant predictor of physical functioning. The present study also used PROCESS (Hayes, 2013) to reveal that depression mediated the relationship between IP and physical functioning, but did not mediate the relationship between II and physical functioning. The present study also revealed that coping did not mediate the relationship between IP and physical functioning, nor did coping mediate the relationship between II and physical functioning. Lastly, the present study revealed that II and IP were both significantly related to depression, and IP was significantly related to II.

Examining II and IP in Relation to Physical Functioning in the Context of Cardiovascular Disease

Cardiovascular disease is currently the leading global cause of death, accounting for 17.3 million deaths per year (American Heart Association, 2015). Since 1921, cardiovascular disease has been the leading cause of death in the United States and currently accounts for over 375,000 American deaths per year (Howarter, Bennett, Barber, Gessner, & Clark, 2014). By the year 2020, the World Health Organization predicts that cardiovascular disease and major depression will become the two leading contributors to the global burden of disease, and that cardiovascular disease alone will account for more than 23.6 million deaths per year by the 2030 (Ali, Rollman, & Berger, 2010). A widespread amount of recent literature has established that psychosocial factors significantly contribute to the pathogenesis of coronary artery disease (Rozanski, Blumenthal, & Kaplan, 2014). The prevalence of comorbid mental health conditions in cardiac patients is well documented with many studies associating psychological risk factors with a poor prognosis for heart diseases (Ali et al., 2010). This extensive knowledge has also contributed to the illumination of the basic pathophysiology that underlies the relationship between psychosocial factors and development and severity of heart disease (Rozanski et al., 2014). However, the identification of psychological predictors for coronary heart disease has produced inconsistent results (Rugulies, 2002). Despite many encouraging findings, there has been insufficient research exploring the interrelationships among some of these conceivable related psychosocial variables and how they may affect the outcomes of coronary heart disease (Shen et al., 2003).

Depression and Cardiovascular Disease Prognosis

Perhaps the most widely studied psychosocial factor in relation to cardiovascular disease is depression. In this paper, depression refers to unipolar clinical depression as diagnosed by

clinical assessment, and depressed mood as measured by standardized self-report scale.

Depression has been found to be an independent risk factor in the etiology of coronary heart disease and the risk of coronary heart disease has been found to be directly related to the severity of depression (Goldston & Baillie, 2008). Comorbid depression is relatively common in patients with coronary heart disease, as approximately one in five patients with newly diagnosed heart disease has major depression (Carney, Freedlan, Miller, & Jaffe, 2002). The prevalence of major depression is similar in patients recovering from acute myocardial infarction and other acute cardiac stresses and once coronary heart disease is established, depression has a negative overall impact on the prognosis of the disease, increasing both the risk of occurrence of future cardiac events and higher risk of mortality (Goldston & Baillie, 2008). The presence of depressive symptoms even in the absence of diagnosed major depressive episodes is associated with increased risk for cardiac events, and a number of studies confirm a relationship between the magnitude of depression and future cardiac events (Rozanski et al., 2014). This data suggests that risk for future cardiac disease associated with depression exists along a continuum relative to the magnitude of depressive symptoms (Rozanski et al., 2014).

There are many proposed mechanisms to explain the relationship between depression and severity of physical symptoms in patients with cardiac disease. Some plausible explanations for the relationship between depression and cardiac mortality and morbidity include biological mechanisms such as antidepressant cardiotoxicity and dysregulation of autonomic, neuroendocrine, and serotonergic systems (Carney et al., 2002). More specifically, depression has been associated with hyperactivity of the hypothalamic-pituitary-adrenocortical (HPA) axis, which results in over-stimulation of the sympathetic nervous system, which then increases circulating catecholamines and serum cortisol (Goldston & Baillie, 2008). These neurohormonal

abnormalities contribute to an imbalance in sympathetic and parasympathetic activity, which results in surges in heart rate and systolic blood pressure, increasing the risk of atherosclerotic plaque rupture and acute coronary thrombosis (Goldston & Baillie, 2008).

According to Rozanski et al. (2014), direct pathophysiological effects of depression involve at least three mechanisms. The first is that depression is accompanied by hypercortisolemia, which is associated with attenuation of the adrenocorticotropin hormone response to corticotropin-releasing factor administration, non-suppression of cortisol secretion after dexamethasone administration, and elevated corticotropin releasing factor concentrations in the cerebrospinal fluid, all of which contribute to more severe symptoms of heart disease. A second mechanism proposed by Rozanski et al. is that due to the association between depression and unhealthy lifestyle behaviors, depressed patients may develop substantial impairment in platelet function. This impairment can include augmented platelet reactivity and release of platelet products including platelet factor 4 and β -thromboglobulin, which are associated with adverse cardiovascular events. The mixture of hypercortisolemia and enhanced platelet function establishes the theoretical basis to explain the proatherogenic effects of depression (Rozanski et al., 2014). Lastly, reduced heart rate variability (HRV) and impaired vagal control have been reported in cardiac patients suffering from depression. HRV is a widely used noninvasive measure that reflects the autonomic regulation of the heart and is measured by beat-to-beat changes in a patient's heart rate (Hoogwegt et al., 2014). Reduced HRV is a well-known predictor of cardiac mortality, including sudden cardiac death resulting from ventricular fibrillation. This finding also supports the assertion that depressed patients may be subject to increased risk for cardiac arrhythmia, further contributing to severity of cardiac related

symptoms. Therefore, HRV might be an important explaining mechanism of the relationship between psychological distress and prognosis (Hoogwegt et al., 2014).

Depression may also contribute to the onset or worsening of cardiovascular disease by triggering recurrent endothelial injuries (Carney et al., 2002). The endothelium is the key regulator of homeostasis in the vascular tissue, and alteration in endothelial function precedes the development of atherosclerosis in patients (Deanfield, Halcox, & Rabelink, 2015). This could occur via promotion of maladaptive health processes, triggering dysregulation of the neurohormonal systems responsible for cortisol and catecholamine secretion, or increasing susceptibility to infection with latent pathogens that colonize the vessel wall (Herbert & Cohen, 1993; Miller, Cohen, & Herbert, 1999; Plotsky, Owens, & Nemeroff, 1995). Furthermore, in consideration of behavioral mechanisms, depression is associated with unhealthy lifestyle behaviors including smoking and poor compliance with medication, which have been shown to contribute to the worsening function of these biological processes and, thus, increased rates of morbidity and mortality in patients with cardiovascular disease (Rozanski et al., 2014). In order to investigate the relationship between depression and physical function in the present study, a regression analysis was used.

Coping and Cardiovascular Disease Prognosis

As previously mentioned, psychological interventions for cardiac patients have mostly focused on depression factors, selecting patients for treatment based on the type and severity of symptoms displayed (Chiavarino et al., 2012). One general shortcoming of all symptom-based approaches is that they do not address, and are not concerned with, the ways that individuals attribute meaning to the events that happen to them. Research findings indicate that the well-being of chronically ill patients is not only determined by medical factors such as disease

severity, but that psychological factors such as coping strategies patients adopt play a crucial role in physical recovery (Kaptein et al., 2006). Penninx et al. (1998) revealed that personal coping resources were directly associated with less depressive symptoms in patients. Furthermore, Hoogwegt et al. (2013) found that emotional distress that results from an inability to cope has been associated with cardiac events and poor prognosis in cardiovascular patients. In patients with coronary artery disease, emotional distress is known to increase the risk of ventricular arrhythmias and mortality independent of biomedical risk factors (Hoogwegt et al., 2013).

In contrast to symptom-based treatment approaches, constructive approaches emphasize the structure of human experience and focus on the emotions, thoughts, and behavioral strategies that lead an individual to develop a certain symptom rather than on the symptom itself (Chiavarino et al., 2012). In other words, constructive approaches focus on specific coping strategies that may lead to depressive symptomatology, and thus the severity of cardiac symptoms. Consistent with this way of thinking, it has been demonstrated that coping strategies following a cardiac event can influence psychological well-being or distress (i.e., depression), perceived quality of life, and health-related behaviors, which can in turn influence the severity of the patient's cardiovascular disease (Chiavarino et al., 2012).

Coping with illness involves both cognitive and behavioral efforts to manage the external or internal demands that are appraised as taxing or surpassing individual resources (Fan, Eiser, Ho, & Lin, 2012). There are two kinds of coping behaviors that have been defined: problem-focused coping, a behavior in which the individual attempts to manage the stressor or solve the problem, and emotion-focused coping, a behavior in which the individual attempts to regulate the emotional response that is induced by the stressor (Folkman et al., 1986). People tend to use problem-focused approaches when they believe that their resources or the demands of the

situation are changeable, and people tend to use emotion-focused coping when they believe they can do little to change the stressful conditions (Sarafino & Smith, 2011). However, some coping strategies can ultimately have negative effects. For example, avoidance as an emotion-focused coping strategy is a specific emotional coping behavioral technique in which the individual attempts to avoid dealing with the stressor at all. This strategy can be helpful for the individual in the short-term, but using avoidance strategies to cope two to three weeks after the stressor occurred has been associated with higher levels of emotional distress (Dunkel-Schetter, Feinstein, Taylor, & Falke, 1992). Emotional coping strategies that acknowledge the stressor, including positive reappraisal and actively processing emotions, have been found to be associated with an overall trend of better adaptation and management of problems in individuals (Fan et al., 2012).

It has been suggested in the cardiological field that emotion-focused coping strategies which are directed at managing one's emotional reactions to a stressor or event are especially important and effective in the time following a cardiac event (Chiavarino et al., 2012). Chiavarino et al. (2012) found emotion-focused coping strategies at the time of a cardiac event were a reliable predictor of disease severity at a three-month follow up. Sul and Fletcher (1985) also found that active problem-focused coping was found to result in more benign long-term outcomes. Another study found that avoidant coping was associated with a widespread psychological distress among cardiac patients, including depression (Ali et al., 2010). Behavioral research has also shown that hope and adaptive coping can help alleviate symptoms and improve outcomes in patients with cardiac disease (Ali et al., 2010). Demonstrating that patients' coping strategies after a cardiac event are more strongly associated with future disease severity than expressed symptomatology supports an emphasis on individuals using the constructive

perspective to make sense of the events that happen to them and deal with these events (Chiavarino et al., 2012). Consistent with the previously mentioned analysis method used to investigate the relationship between depression and physical function, a regression analysis was also used in the present study in order to investigate the relationship between coping and physical functioning in a cardiac rehabilitation population.

Invalidation and Cardiovascular Disease Prognosis

A copious amount of literature has revealed that in addition to personal coping resources, social support may also contribute to variability in the impact of chronic illness (Penninx et al., 1998). The robust association of social support and health status has been well-documented (Case et al., 2002). In a study of depression among patients in cardiac rehabilitation, Holohan et al. (1997) found that more perceived social support was associated with active coping, which in turn was related to lower depressive symptomatology. Depressed patients have also been found to be less likely to utilize social support resources available to them (Berkman, 1995). As previously mentioned, depressive symptomatology in turn was associated with worse health outcome in cardiac patients and an increased likelihood of experiencing angina, maintaining smoking habits, and a failure to return to work (Shen, McCreary, & Myers, 2003). Shen et al. (2003) discovered that social support was a direct independent predictor of post-treatment physical functioning in cardiac rehabilitation patients. Individuals with higher perceived social support were less likely to engage in detrimental coping and experienced less mood disturbance.

Social support, like many other psychosocial factors, influences the extent to which individuals engage in high risk behaviors and maladaptive coping mechanisms such as smoking, poor diet, and excessive alcohol use (Penninx et al., 1998). Social support factors have also been shown to have direct pathophysiological effects (e.g., hypercortisolemia; Rozanski et al., 1999).

Initial studies focused on the quantitative aspects of social support, including the presence of family affiliations, amount of friends, and scope of participation in a group or organization (Rozanski et al., 1999). However, the qualitative nature of social support (i.e., perceived amount of social support) has been increasingly subject to study.

The support received from others can be fundamental in helping to improve the quality of life in patients suffering from chronic disease (Kool, 2012). People are social beings for whom positive interactions as well as supportive communication are important. In other words, people hold a deep-seated need to belong and to be socially accepted (Bediako & Friend, 2004). However, many patients not only experience a lack of social support, but a lack of understanding as well. In these cases, people in the social environment may accuse the patient of being whiny or exaggerating the severity of his or her symptoms, and may tell the patient that (s)he should work harder, stop complaining, and feel better. In this case, the term invalidation is used to capture the construct that refers to such negative rejections (Kool, 2012).

It is important to note that invalidation is not simply the opposite of social support. Invalidation is a social phenomenon that is determined by not only the provider of the invalidation, but the perceiver as well. Several studies have shown that invalidation may arise from different sources, including spouses, colleagues, health professionals, and society, and can hinder the interaction of patients with other people (Ghavidel-Parsa et al., 2014). Invalidation can be reflected in an individual's overall perception of emotional, behavioral, and cognitive responses from others. Kool et al. (2012) also found that from the perspective of the patients, invalidation not only includes lack of understanding and denying, but also lecturing and overprotecting. Therefore, invalidation can be more specifically defined in a healthcare setting as "the perception of cognitive, affective, and behavioral responses of others that are experienced as

denying, lecturing, overprotecting, not supporting, and not acknowledging with respect to the condition of the patient” (Kool et al., 2012, p.30).

II is one type of invalidation that plays a role in patients’ overall health status. II can be defined as attitudes of distrust, suspicion, lack of support for, or acknowledgement that a patient is suffering from an illness (Blom et al., 2011). Lobo et al. (2014) suggested that constant invalidation of symptoms may serve as a barrier in effective management of pain and its associated symptoms, and may also interfere with shared decision making processes regarding patient treatment. Due to complexity and variance of many symptoms of chronic illness, the process of diagnosis and treatment can be frustrating for patients as well as physicians. Previous studies have indicated that patients suffering from chronic illness could benefit from empathy, trust, and recognition of their disorder (Blom et al., 2011). Invalidation of the illness and symptoms can cause disbelief about the patient’s presenting problems, which can result in misunderstanding, rejecting, and discounting by others and suspicion that the symptoms are either exaggerated or have a psychological basis (Ghavidel-Parsa et al., 2014). Previous studies have also provided evidence that fewer experiences of II have been associated with a higher quality of life for patients, which can result in less severe depressive symptoms (Lobo et al., 2014). Research suggests that II can also weaken a patient’s ability to solve interpersonal and emotional difficulties, which can affect their overall quality of life (Blom et al., 2011). Study findings from Lobo et al. (2014) also demonstrate that II may have a detrimental effect on health outcomes and overall quality of life. This study specifically showed that invalidation of patients’ physical symptoms could have an impact on self-development, relationships with others, and interactions with society, which may further manifest into depressive symptoms and impact physical functioning.

It is suggested that in addition to having a negative effect on mental well-being, invalidation may impact physical health and social function (Ghavidel-Parsa et al., 2014). It also has been shown to decrease social support and increase social rejection (Kool et al., 2009). According to social support theory, social support advances health and buffers the impact of external stressors on health, implying that a lack of social support may be associated with worse health (Bediako & Friend, 2004). These findings suggest that invalidation would have a negative impact on patients' health as well, as invalidation is not only a lack of social support, but overt rejection and not being acknowledged. This invalidation is in direct contrast to having social support where one would receive positive and helpful responses such as affection, information, instrumental aid, and spending positive time with others (Laidmäe, Leppik, Tulva, & Hääl, 2009). In fact, it has been suggested that invalidation might be more harmful than not receiving social support in patients, because invalidation can lead to higher levels of non-disclosure of the illness, social isolation, a decrease of health care adherence and treatment, and changes in cognition that may affect a patient's health (Rokach, Lehcier-Kimel, & Safarov, 2006). Therefore, besides simply a lack of positive social interactions, invalidation may have a complementary negative effect on patients' well-being and overall physical functioning (Kool, 2012).

Further evidence indicates that more discounting by a patient's social network may be associated with worse mental well-being and worse physical functioning, and that the more invalidation patients experience, the greater the disease impact and the greater the symptom severity (Ghavidel-Parsa et al., 2014). Invalidation includes a lack of positive social responses, and these positive social responses are thought to directly promote health and buffer the impact of external stressors on health. Invalidation may also be harmful to patient's health for additional

reasons other than a lack of social support. Invalidation includes an active component of social rejection, which has been indicated in past research to amplify pain via activation of neural structures such as the anterior cingulate cortex (Kurzba & Leary, 2001). Research suggests that focusing on patients' perception of invalidation may lead to improvements in physical health, and that experimental research should examine effects of not only promoting social support, but decreasing invalidation (Kool, 2012).

The specific mechanisms of how II relates to worsening physical functioning continue to remain unknown. However, it has been shown that patients who feel invalidated are more likely to distance themselves from others and become socially isolated, which often leads to depression, which has a known effect on the severity of physical functioning (Rokach et al., 2006). Patients who experience invalidation also sometimes withdraw from traditional medical care instead of adjusting to their illness (Kool, 2012). This avoidant coping has also been shown to contribute to higher levels of emotional distress, and thus may contribute to worsening physical symptoms. Consistent with the previously stated method of analyses used to investigate the relationship between depression and physical function, and coping and physical function, a regression analysis was also used in the present study in order to investigate the relationship between II and physical functioning in a cardiac rehabilitation population.

IP and Cardiovascular Disease Prognosis

Another important psychological factor that may influence symptom severity and physical functioning in cardiac patients is the level of IP. IP is a process through which an individual constructs a cognitive representation of an illness and has also been shown to influence symptom severity and physical functioning in cardiac patients (Arran, Carufurd, & Simpson, 2013). According to the common sense model, patients actively process, understand,

and interpret information related to their health status or illness (Fan, Eiser, Ho, & Lin, 2012). Patients' representations of their illness are based on beliefs about the following five components: identity (referring to the label or nature of the condition), causal beliefs (beliefs about the causes of their disease), timeline (duration of their disease), consequences (the impact of their disease on their life), and cure (whether the disease is amenable to cure or control). There are two parallel-processing pathways including cognitive representations and emotional responses to their illness. Using these representations, patients plan and implement coping behaviors in order to manage their health related problems (Fan et al., 2012).

Arran, Carufurd, and Simpson (2013) found that IPs were positive predictors of depression and that IPs play a significant role in levels of psychological distress, thus contributing to worsening physical symptoms. One model that is widely used in the field of chronic illness that best illustrates the relationship between IP and depression is the self-regulation model. Self-regulation describes the process through which an individual constructs a cognitive representation of an illness, selects a coping strategy in response to the perceived threat, and evaluates its effectiveness and outcome (Arran et al., 2013). These representations directly influence the coping behaviors utilized by the individual and, consequently, that individual's emotional response to the illness. In short, the self-regulation model postulates that an individual chooses coping strategies based on their own perceptions of the illness. This combination of IPs and coping strategies is thought to influence the person's emotional reaction to the illness, contributing to the level of psychological distress, such as depression (Arran et al., 2013). As previously discussed, depressive symptomatology is an established predictor of a worse prognosis and increased severity of symptoms in cardiac patients. This implies that coping mechanisms selected by the patient based on his or her perception of the illness may be

responsible for increased amounts of depressive symptoms, which may then negatively influence the patient's physical health.

Studies have shown that when patients perceived their disease to be controllable, the majority used cognitive strategies such as reappraisal and problem-focused coping in order to manage their problems (Kaptein et al., 2006). Patients who perceive that their disease will have a low impact on their quality of life have been shown to have better adjustment outcomes to coping with their disease (Hagger & Orbell, 2003). The interaction of problem-focused coping and perceived control has also been found to be a significant predictor of depression, as patients who perceived higher levels of control and used problem-solving coping had lower levels of depression than those who did not (Osowiecky & Compas, 1998). However, the question still remains whether IPs influence well-being via coping, or whether IPs and coping each influence well-being independently (Kaptein et al., 2006). Consistent with all other previously mentioned methods of analyses, a regression analysis was also used in the present study in order to investigate the relationship between IP and physical functioning in a cardiac rehabilitation population.

Present Study

In consideration of previous empirical evidence, the present study sought to better understand the specific ways that II and IP contribute to the severity of physical symptoms in cardiovascular rehabilitation patients. This study aimed to examine the specific mechanisms involved in the relationship between II and physical functioning in cardiac rehabilitation patients and the specific mechanisms involved in the relationship between IP and physical functioning in cardiac rehabilitation patients. More specifically, the present study focused on how II and IPs are each individually related to coping behaviors and depressive symptoms, and how those behaviors

and symptoms relate to the patient's physical functioning. The present study had two primary goals: First, to identify the strength of the relationships between IP and physical functioning and II and physical functioning upon enrollment in the rehabilitation program. Second, the present study sought to identify the role, if any, that coping behaviors and depressive symptoms play in these relationships. Thus, due to the comprehensive purpose of this study, the following hypotheses were proposed:

Hypothesis 1: Physical functioning (as measured by a composite score of the SF-36, heart rate, body mass index, and systolic blood pressure) will be significantly predicted by II scores (as measured by scores on the Illness Invalidation Inventory), IP scores (as measured by the Illness Perception Questionnaire), positive coping strategy scores (as measured by the Brief Coping Orientation to Problems Experienced Inventory), and depression symptom severity scores (as measured by the Center for Epidemiologic Studies Depression Scale-Revised). That is, the severity of physical symptoms indicative of cardiac disease will be predicted by whether the individual perceives his or her social environment to be invalidating of his or her illness, the individual's cognitive representation of the illness, whether the individual has used a positive coping strategy to manage distress, and whether the individual experiences elevated symptoms of depression. This hypothesis is based on previous research that has demonstrated a relationship between physical functioning and invalidation (Ghavidel-Parsa et al., 2014), IPs (Arran et al., 2013), positive coping behaviors (Kaptein et al., 2006), and depression (Goldston & Baillie, 2008).

Hypothesis 2: Coping mechanisms (as measured by the brief COPE) and depression symptom severity (as measured by the CESD-R) will both mediate the relationship between invalidation (as measured by scores on the 3*I) and physical functioning (as measured by a

composite score of the SF-36, heart rate, body mass index, and systolic blood pressure) as well as mediate the relationship between IP (as measured by the IPT) and physical functioning (as measured by a composite score of the SF-36, heart rate, body mass index, and systolic blood pressure). That is, the significance of the relationship between II and IP on physical functioning will be influenced by coping style and severity of depressive symptoms. This hypothesis is based on evidence that invalidation and IP appear to influence an individual's coping style (Arran et al., 2013; Holohan, 1997), which appears to influence the severity of an individual's depressive symptoms (Chiavarino et al., 2012), which appear to influence an individual's level of physical functioning (Goldston & Baillie, 2008). Despite the absence of direct effects in Hypothesis 1, Hypothesis 2 was performed investigating mediation of all constructs in order to investigate opposing processes; that is, to investigate whether the absence of direct effects is the result of inconsistent mediation of other constructs involved (Murayama & Elliot, 2012).

Method

Participants

This study utilized participants from the Cardiac Rehabilitation program at the Wellness Center of the University of South Carolina Aiken. A G*Power analysis revealed that in order to achieve statistically significant results, data from 44 participants would be required, which was achieved in the present study. Admission criteria for participation in the study consisted of the following criteria: a) a recent cardiac trauma in the form of myocardial infarction, coronary artery bypass graft surgery or percutaneous coronary intervention b) the ability to read at a level commensurate with the self-report measures employed in the study; and c) enrollment in the cardiac rehabilitation program. Rehabilitation members were not offered any compensation for

participating in the study, since the study was a review of assessments gathered during the rehabilitation program.

Routine Measures

Demographics Questionnaire (see Appendix A). A questionnaire was developed in order to ascertain important demographic information about each participant (i.e., gender, age, ethnic and cultural background, socioeconomic status, etc.) and the type of cardiac trauma experienced that led to enrollment in the cardiac rehabilitation program. Demographic information was assessed via forced-choice response options and the individual was asked to describe the cardiac event experienced and the date at which it occurred in an open-ended response.

The 36-Item Short-Form Health Survey –3-month form SF-36; Ware & Sherbourne, 1992; see Appendix B). The SF-36 is a 36-item survey of patient health consisting of a multi-item scale that assesses eight health-related quality of life domains: limitations in physical functioning, limitations in usual role functioning because of physical health problems, bodily pain, general health perceptions, vitality, limitations in social functioning because of physical or emotional problems, limitations in usual role functioning because of emotional health problems, and general mental health. Each subscale contains statements relevant to a particular domain that are rated differently, depending on the domain being measured. For instance, questions assessing for limitations in physical activity are rated on a 3-point Likert scale where the individual is to indicate whether one's health limits one's physical activities (e.g., 1 = yes, limited a lot, 2 = yes, limited a little, 3 = no, not limited at all); in contrast, questions measuring vitality and mental health are to be rated on a 6-point Likert scale where feelings are to be rated in frequency over the past four weeks (e.g., 1 = all of the time, 2 = most of the time, 3 = a good bit of the time, 4 = some of the time, 5 = a little of the time, 6 = none of the time). The SF-36 has elicited high

internal consistency when used with patients suffering from a myocardial infarction with Cronbach alphas ranging from .72 to .92 (Failde & Ramos, 2000). Under each of the eight dimensions measured, item scores are coded, summed, and transformed to a scale ranging from 0 (worst health status) to 100 (best health status).

Scores on the SF-36 were combined with the patient's heart rate, systolic blood pressure, and body mass index data into one overall physical functioning composite score. First, correlations were computed between all variables (Table 1). It is important to note that the SF-36 was reverse coded in order to compute an accurate score for the items, and thus is negatively correlated with the objective physical measures. Each raw score was then standardized by converting it into a z-score, and the z-scores were then summed and averaged in order to create a standardized composite for physical functioning that was then used in subsequent analyses.

The Center for Epidemiologic Studies Depression Scale- Revised (CESD-R; Eaton, 2004; Radloff, 1977; see Appendix C). The Center for Epidemiologic Studies Depression Scale is a 20-item scale used to measure symptoms of depression in nine different groups as defined by the American Psychiatric Association Diagnostic and Statistical Manual, fifth edition. Using a forced-choice format, individuals were asked to rate on a 5-point Likert scale how often they experience symptoms (e.g. 0 = not at all or less than 1 day, 1 = 1-2 days, 2 = 3-4 days, 3 = 5-7 days, and 4 = nearly every day for 2 weeks). These symptoms include sadness, loss of interest, appetite, sleep, concentration, guilt, tiredness, movement, and suicidal ideation. The total CESD-R score was calculated as a sum of responses to all 20 questions and was used in determination of possible depressive symptom categories.

The Brief Illness Perception Questionnaire (Brief IPQ; Broadbent, Petrie, Main, &

Weinman, 2006; see Appendix D). The Brief Illness Perception Questionnaire is a 9-item standardized instrument developed in order to assess cognitive and emotional illness representations. Eight items are rated on an 11-point (0-10) end-defined response scale. Five of the items assess cognitive illness representations: “consequences” (Item 1), “timeline” (Item 2), “the degree of personal control over the disease” (Item 3), “treatment control” (Item 4), and “identity” (Item 5). Two of the items assess emotional representations: “concern” (Item 6) and “emotional response” (Item 7), while one item assesses “illness understanding” (Item 8). High scores gained on these dimensions represent strongly-held beliefs about more serious consequences of the illness (Item 1), its more pronounced chronic nature (Item 2), stronger positive beliefs in controllability of the illness (Item 3 and 4), a greater number of symptoms attributed to the illness (Item 5), a higher level of patient’s emotional distress arising from the illness (Item 6 and 7), and better personal understanding of the illness (Item 8).

The Brief Coping Orientation to Problems Experienced Inventory (Brief COPE; Carver, 1997; Muller & Spitz, 2003; see Appendix E). The Brief COPE is a short, multidimensional inventory including 14 two-item scales that measure 14 conceptually differentiable coping reactions. These strategies, which include adaptive as well as potentially problematic responses, are acceptance, active coping, positive reframing, planning, using instrumental support, using emotional support, behavioral disengagement, self-distraction, self-blame, humor, denial, religion, venting, and substance use.

The Illness Invalidation Inventory (3*I; Kool et al., 2010; see Appendix F). The 3*I is a 40-item scale that assesses patients' perception of responses of others that are perceived as denying, lecturing, not supporting and not acknowledging the condition of the patient across five different sources. It assesses two internally consistent dimensions of invalidation: discounting

and lack of understanding.

Duke Activity Status Index (DASI; Hlatky & Mark, 1989; see Appendix G).

The Duke Activity Status Inventory is a 12-item questionnaire developed to measure functional status of the individual while also providing insight into selected aspects of quality of life. This scale uses the individual's capacity in daily living activities in order to gauge functional capacity. These activities represent major aspects of physical functioning including: personal care, ambulation, ability to carry out household tasks, ability to engage in recreational activities, and ability to engage sexually. Participants were asked to indicate if and how well they could engage in each task, given one of four options, (1 = Yes, with no difficulty, 2 = Yes, but with some difficulty, 3 = No, I can't do this, or 4 = Don't do this for other reasons). The DASI has elicited high internal consistency when used with patients who have chronic coronary disease, with Cronbach alphas ranging from .81 to .89, while there were no statistically significant differences for stable patients in the two-week re-test period (Alonso et al., 1997). For every item listed on this measure, there is a corresponding weighted value (e.g., ability to walk around the house = 1.75; ability to run a short distance = 8.00) used for scoring purposes. In order to score the DASI, the total number of corresponding weighted values to all questions where the rater answered one (Yes, with no difficulty) is summed. In order to get the estimated peak oxygen uptake score, the summed number was entered into the following equation $[0.43 * (\text{duke status index})] 9.6$ and then divided by 3.5 to convert it into metabolic equivalents. Scores on the DASI may range from 0 – 52.8, with metabolic equivalent scores ranging from 0 – 9.89. Higher metabolic equivalent scores are indicative of a more physically active person with a corresponding higher functional capacity. In contrast, a low score on this measure indicates significant deficits in the ability to engage in physical activity and an overall poorer quality of

life.

State-Trait Anxiety Inventory-Y-2 Form (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983; see Appendix H). The STAI Y-Form serves as a measure of state (Y-1) and trait (Y-2) anxiety, and assesses the overall severity of anxiety in adults. Individuals rate on a 4-point Likert scale how intensely they experience symptoms of anxiety at that moment while taking the assessment (e.g., 1 = Not at all, 2 = Somewhat, 3 = Moderately so, 4 = Very much so) and also generally speaking under normal circumstances (e.g., 1 = Almost never, 2 = Sometimes, 3 = Often, 4 = Almost always). The instrument is divided into two sections, with each form having a total of twenty questions. The range of scores is 20-80, with a higher score indicating greater anxiety. Some of the questions assess for the absence of anxiety and therefore must be reverse-scored. For the purposes of this study, consistent with rehabilitation procedures, only the trait (Y-2) form was used. The test-retest reliability of the STAI was reported by Spielberger and colleagues (1970) to be .54 for the state measure and .86 for the trait measure. The STAI is considered a valid scale, with Cronbach's alphas ranging from 0.87- 0.92 (Van der Ploeg, Defares, & Spielberger, 1970).

Procedure

All data was gathered from the cardiac rehabilitation program located at the USC Aiken Wellness Center. Within their first six sessions enrolled in the program, all rehabilitation participations were asked to complete routine assessments for the purposes of tracking rehabilitation progress. Patients completed the measures with a rehabilitation assistant at the cardiac rehabilitation facility. Patients were also given the option to take measures home with them to complete and return at their next session if they began to feel overwhelmed or fatigued. These routine assessments included the one-year 36-Item Short Form Health Survey (SF-36;

Ware & Sherbourne, 1992), the Brief Illness Perception Questionnaire (Brief IPQ; Broadbent, et al., 2006), the Brief Coping Orientation to Problems Experienced Inventory (Brief COPE; Carver, 1997; Muller & Spitz, 2003), the Illness Invalidation Inventory (3*1; Kool et al., 2010), the Duke Activity Status Index (DASI; Hlatky & Mark, 1989), the State-Trait Anxiety Inventory Y-1 form (STAI; Van der Ploeg, et al., 1980), and the Center for Epidemiologic Studies Depression Scale- Revised (CESD-R; Radloff, 1977; Eaton, 2004).

Rehabilitation members were given the option to complete these assessments during one interview session or two based on their personal preference. Upon having completed the assessment paperwork, rehabilitation patients were provided feedback regarding their scores and will be offered appropriate referrals and supportive services as deemed necessary. Upon having completed the interview, all rehabilitation members were informed that they would be asked to return to fill out the routine exit assessments required by the rehabilitation program upon completion of the program.

Results

Preliminary Analyses

A total of 44 individuals were enrolled in the cardiac rehabilitation program located at the USCA Wellness Center during data collection procedures. Of these 44 individuals, 25% were women (n=10) and 75% were men (n=34). One hundred percent (n=44) of the individuals reported their ethnicity as being Caucasian. The average age of participants was 72 years old, with ages ranging from 58 to 88 years old and a standard deviation of 7.8. Of the 44 individuals who entered the program, 75% reported attending the cardiac rehabilitation program after having suffered a first-time cardiac event, and 25% reported having suffered one or more events prior to rehab enrollment. In regards to event type, 25% reported having a coronary stent implanted, 23%

reported having a heart attack, 21% reported having coronary artery bypass grafting, 16% reported having suffered multiple events, 11% reported having a valve replaced, 2% reported having bypass surgery, and 2% reported congestive heart failure. Demographic information describing rehabilitation members can be found in Table 2.

Means, standard deviations, and other descriptive statistics for data collected at entrance can be found in Table 3. IP, II, and Depression statistics were then organized by severity of cardiac event, which can be found in Table 4. Correlations between all variables were computed (Table 5). There was a strong, positive correlation between depression and IP, $r(44) = 0.52, p < 0.01$. There was a moderate negative correlation between depression and physical function, $r(44) = -0.47, p < 0.01$. There was a moderate, positive correlation between IP and II, $r(44) = 0.48, p < 0.01$, and a moderate, negative correlation between IP and physical functioning, $r(44) = -0.41, p < 0.01$. Lastly, there was a moderate, negative correlation between II and physical functioning, $r(44) = -0.30, p < 0.05$. Additionally, Cronbach's alpha was computed to determine the reliability of each measure (Table 6). Thus revealed that the Brief COPE had an alpha of 0.49, the IPQ had an alpha of 0.86, the 3*I had an alpha of 0.90, the SF-36 had an alpha of 0.82, and the CESD-R had an alpha of 0.92.

Hypothesis 1: Physical functioning will be predicted by IP, II, coping, and depression scores.

To examine the extent to which physical functioning could be explained by the other variables, physical functioning was regressed onto the four predictors simultaneously: Positive coping, IP, invalidation, and depression (Table 7). The overall model was significant, $F(4,39) = 3.68, p = .012, R^2 = .27$, indicating that 27% of the variance in physical functioning could be explained by the set of predictors. Inspection of each predictor

individually revealed that only depression had a significant relationship with physical functioning, $B = -.90$, $p = .042$. Specifically, each 1-unit increase in depression was associated with a .90 decrease in physical functioning.

Hypothesis 2: Positive coping and low depression scores will strengthen the relationship between invalidation and physical functioning and perception and physical functioning.

Results from Hypothesis 1 indicated that depression was the only significant predictor of physical functioning. In order to investigate Hypothesis 2, four mediation tests were performed.

First mediation test

PROCESS (Hayes, 2013) was used in order to test whether coping mediated the relationship between invalidation and physical functioning (Figure 1). The overall model was not significant, $F(1,42) = 1.32$, $p = 0.26$. The direct effect was not significant ($B = -1.59$, $95\% CI = -3.24, 0.07$, $p = 0.06$). However, this effect can be considered marginally significant as the hypothesis is one-tailed. The indirect effect was not significant ($B = -0.07$, $95\% CI = -0.45, 0.35$).

Second mediation test

Next, the same procedure was used to test whether depression mediated the relationship between invalidation and physical functioning (Figure 2). The direct effect was not significant ($B = 0.98$, $95\% CI = -2.54, 0.57$, $p = 0.21$). The indirect effect was not significant either ($B = -0.67$, $95\% CI = -1.45, 0.29$).

Third mediation test

Mediational analyses were performed using the same procedure in order to determine whether coping mediated the effect of IP on physical functioning (Figure 3). There was a significant direct effect ($B = -0.75$, $95\% CI = -1.27, -.22$, $p = 0.01$), indicating that

higher IP was associated with lower physical functioning. However, the indirect effect through positive coping was not significant ($B = -0.01$, 95% $CI = -0.13, 0.08$).

Fourth mediation test

Finally, the same procedure was used in order to examine whether depression would mediate the relationship between IP and physical functioning (Figure 4). The direct effect was not significant ($B = -0.43$, 95% $CI = -1.00, 0.15$, $p = 0.14$). Interestingly, the indirect effect was indeed significant ($B = -0.33$, 95% $CI = -0.70, -0.04$).

Exploratory Analyses

II is defined as encompassing the perception of cognitive, affective and behavioral responses of others that are perceived as denying, lecturing, overprotecting, not supporting and not acknowledging with respect to the condition of the patient (Kool, 2012). This definition suggests that II may be related to the patient's perception of his or her illness in reference to others' perceptions. Thus, a second exploratory regression analysis was performed in order to determine whether or not II was significantly related to IP (Table 8). This analysis revealed that IP was significantly related to II in the cardiac rehabilitation population ($B = 0.48$, $p = 0.00$).

Lastly, based on these significant relationships between II and depression, IP and depression, and II and IP, PROCESS was used in order to investigate whether or not II mediated the relationship between IP and depression (Figure 5). This analysis revealed that there was a significant direct effect ($B = 0.33$, 95% $CI = 0.12, 0.54$, $p = 0.00$), indicating that higher IP was associated with higher depression scores. However, the indirect effect through invalidation was approaching significance, but not significant ($B = 0.02$, 95% $CI = -0.07, 0.21$).

Discussion

This study aimed to better understand the specific ways that II and IP are related to the severity of physical symptoms in cardiovascular rehabilitation patients. More specifically, this study examined the specific mechanisms involved in the relationship between II and physical functioning in cardiac rehabilitation patients and the specific mechanisms involved in the relationship between IP and physical functioning in cardiac rehabilitation patients. The present study first used regression analyses in order to determine the extent to which II, IP, coping and depression predicted physical functioning, and then by using PROCESS in order to identify potential mediators in these relationships. Furthermore, given the lack of understanding of how these relationships are mediated, the present study focused on how II and IPs are each individually related to coping behaviors and depressive symptoms, and how those constructs relate to patients' physical functioning.

Coping

The first hypothesis that positive coping mechanisms would predict better physical functioning in a cardiac rehabilitation population was not supported in the present study. These results are contrary to previous research which has indicated that positive coping mechanisms including problem and emotion focused coping are predictive of better physical functioning after a cardiac trauma (Chiavarino et al., 2012). However, most of these studies have looked at predictors of coronary heart disease in initially healthy samples and studied the development of heart disease over time, whereas the present study utilized participants already diagnosed and in rehabilitation for a heart condition. Thus, it is possible that participants in the present study may have already implemented changes in lifestyle or cognitions upon diagnosis of their heart condition; thus, the relationship between coping mechanisms and physical functioning during recovery may be different than the initial relationship between coping mechanisms and physical

function during the development of the cardiac disease. This is consistent with previous literature suggesting that the question of whether illness perceptions influence well-being via coping or whether illness perceptions and coping each influence well-being independently should be investigated in further, preferably with longitudinal studies (Kaptein et al., 2006).

It may also be the case that the presence of other psychosocial factors that were unaccounted for in this study may influence the relationship between coping and physical function. For example, hostility, optimism, and other personality characteristics may play a role in physical health outcomes, and may also influence an individual's style of coping (Shen et al., 2003).

Sul and Fletcher (1985) found that active problem-focused coping was found to result in more benign long-term outcomes following cardiac events, and Ali et al. (2010) found that avoidant coping was associated with widespread psychological distress among cardiac patients, including depression. In contrast, previous research indicates that using avoidance strategies to cope soon (two to three weeks) after a stressor occurred has been associated with higher levels of emotional distress (Dunkel-Schetter, Feinstein, Taylor, & Falke, 1992). Since measures were only administered at the beginning of the cardiac rehab process, patients may have been using those avoidant coping strategies for only a brief period of time, between when the cardiac trauma occurred and entrance into rehabilitation. Future research collecting data upon completion of the program may help to better illuminate effects of avoidant coping on physical functioning in patients over a longer time frame.

Further, results of Hypothesis 2 indicated that coping was not predicted by invalidation or IP. Thus, the expectation that positive coping strategies could be mediators in the relationships between IP and physical functioning and II and physical functioning seems unlikely. In

considering why coping strategies were not predicted by invalidation or IP, the self-regulation model proposed by Leventhal (1997) may be relevant. The self-regulation model assumes that health-related behavioral patterns such as coping strategies are a result of complex and comprehensive representations of illness (Leventhal, 1997). In addition to how the patient perceives the illness itself, multiple factors including the perceived consequences of the illness, perceived causes, timeline, and cure or control of the illness all contribute to behaviors and coping mechanisms an individual selects. It is also likely that an individual may not understand his or her illness to the fullest extent, and thus may not be able to appropriately select an effective coping strategy (Fan et al., 2013). Additionally, based on the significant relationship between invalidation and perception, it is not unreasonable to consider the likelihood of these numerous perception factors influencing an individual's perceived invalidation from others, which is consistent with the definition provided by Kool (2012) that invalidation encompasses the perception of behavioral responses of others that are perceived as denying, lecturing, overprotecting, not supporting, and not acknowledging the patient's condition. Consequently, coping strategies selected based on feelings of invalidation are unlikely to be consistent among individuals who may perceive their illnesses differently. This is consistent with previous studies, which suggest that patients plan and implement coping behaviors based on cognitive representations and emotional responses to their illness (Fan et al., 2012).

However, based on the low Cronbach's alpha reliability score of the Brief COPE, it is most likely that the reason coping was not shown to be predictive of physical functioning, nor related to any other constructs is due to the low reliability score of the measure itself. This low score is likely a result of using an overall coping score rather than reporting subscale scores to

look at different types of coping. Future studies should note this and adjust administration of the measure accordingly.

Depression

As hypothesized, depression was significantly related to physical functioning in the cardiac rehabilitation population. This is consistent with previous studies that have found a significant relationship between depression and coronary heart disease (Carney et al., 2002; Goldston & Baillie, 2008; Rugulies, 2002). Analyses revealed that depression was also a significant mediator of the relationship between IP and physical functioning, which is consistent with previous studies that indicate that IP is related to emotional distress, and that emotional distress is related to depression (Arran et al., 2014; van den Broek et al., 2014). Meditational analyses used to test Hypothesis 2 revealed that when depression was tested as a mediator of the relationship between IP and physical functioning, the direct effect was not significant, but the indirect effect was. This may suggest opposing processes, such that IPs may lead to behaviors that increase physical functioning while simultaneously leading to depression, which decreases physical functioning (Marayuma & Elliott, 2013). However, as shown in Table 3, II, IP, and depression were all significantly associated with health outcomes, thus, the probability of opposing processes is unlikely. Furthermore, the regression analysis for Hypothesis 1 indicated that there was overlapping variation between the 3 constructs and that depression was the strongest, which was also evident in mediation analyses.

The relationships between IP and depression, and between depression and physical functioning were also significant. Thus, results indicate that IP was significantly related to depression, and depression was significantly related to physical functioning. Therefore, an individual's physical functioning may be related to his or her perception of the illness. This

perception may be related to emotional distress, which may be related to reduced physical functioning. This is consistent with findings from Hypothesis 1, which revealed that IP did not significantly predict physical functioning in this cardiac rehabilitation sample. These findings are contradictory to previous findings suggesting that IPs contribute directly to physical health (Kaptein et al., 2006). However, previous findings also indicate that IPs affect physical health via coping mechanisms (Fan et al., 2010).

An interesting finding is that when coping was tested as a mediator of the relationship between IP and physical functioning, the direct effect was significant, but the indirect effect was not. Thus, when coping was isolated as a mediator, IP was significantly related to physical functioning. Thus, it may be important to consider isolating these constructs in future studies in order to potentially identify causality and directionality.

Contradictory to Hypothesis 2, the prediction that depression would mediate the relationship between invalidation and physical functioning was not supported. While considering the relationships between invalidation, depression, and physical health, previous research suggests that invalidation may impact physical health and social function but specific mechanisms as to how these constructs relate have not been defined (Ghavidel-Parsa et al., 2014).

However, while depression did not significantly mediate the relationship between invalidation and physical functioning, the relationship between invalidation and depression was significant, as was the relationship between depression and physical functioning. Thus, it is likely that an individual may have lower physical functioning if (s)he feels invalidated about his or her illness, and this invalidation may be related to emotional distress, including depressive symptoms, which are related to reduced physical functioning.

Additionally, in regards to II, predictions of Hypothesis 1 that invalidation would significantly predict physical functioning were not supported. These results are contradictory to previous research suggesting that invalidation is significantly correlated with symptom severity and health status (Ghavidel-Parsal et al., 2014). However, to our knowledge, previous studies have investigated invalidation in the context of fibromyalgia and rheumatology (Ghavidel-Parsa et al., 2014; Kool, 2012) and this is the first study to investigate invalidation in relation to cardiac disease. Previous research has also separated invalidation into more specific constructs including discounting and lack of understanding, while this study used a total invalidation score. In addition, while previous research indicates that emotional distress is associated with lower physical functioning in cardiac patients (Hoogwegt et al., 2014). However, if a patient does not experience emotional distress as a result of invalidation, he or she may not experience a reduction in physical functioning. Thus, it may be possible that some patients can experience II, but may manage that invalidation in a way that does not result in emotional distress.

Lastly, a regression analysis was performed in order to determine if II may be related to the patient's perception of his or her illness revealed that IPs are significantly related to II. Thus, the worse an individual perceives an illness to be, the more likely it is that this will be related to higher feelings of invalidation from others. The opposite may be true as well, as it is possible that invalidation may be related to illness perceptions. Future studies should investigate directionality in this relationship. Consistent with previous findings in the present study, this suggests that IP and II are both related to depression. Due to the significant relationships between IP and II, II and depression, and IP and depression, a mediation analysis was performed in order to determine if II might mediate

the relationship between IP and depression. This relationship was not found to be approaching significance.

Strengths and Limitations

First, this study used PROCESS in order to investigate the interrelationships among multiple variables that, to our knowledge, have not been previously connected in the health literature. Additionally, to the best of our knowledge, this was the first study to investigate the construct of illness invalidation in relation to a cardiac rehabilitation population, as almost all previous studies have examined II in relation to rheumatology diseases. Likewise, it is the first of its kind to investigate IP in a cardiac setting, and the relationship between IP, depression, and physical health can prove extremely beneficial in future health interventions.

Although there were several novel findings within the present study, there were also several limitations, which should be addressed in future studies. One limitation was the demographic composition, which had very little variability. For example, the sample was comprised of 44 participants enrolled in a cardiac rehabilitation program located in a small southeastern community, and thus may not be fully representative of the full range of beliefs and experiences of those differing geographic regions or with different medical diagnoses. It should also be noted that the sample size was relatively small with only 44 participants, who were mostly white males of high socioeconomic status. While the results of the present study may be generalizable to populations with similar demographic composition who have experienced a cardiac event, caution should be taken in generalizing the results to other types of medical illness or the larger population due to representativeness issues. Thus, future studies should make a more determined effort to increase the number of racially diverse participants as it is necessary to

determine whether patterns established in the empirical findings in the present study may pertain more so to non-minorities than they do to minorities.

Additionally, due to the nature of the cardiac rehabilitation population, it is likely that the sample did not include individuals who were employing completely avoidant coping strategies, as all individual enrolled in the program were implementing some level of active coping by attending the program. Thus, it is likely that the sample did not include patients with a completely avoidant style of coping.

It is possible that participants may not have responded in a forthright manner given that measures were first completed upon entrance into the program, when participants may have felt particularly self-conscious about their physical abilities or symptoms of distress. Participants also reported feeling overwhelmed with the amount of measures administered, and thus may not have taken the time to answer honestly and accurately. Therefore, future research may benefit from the use of alternative measurement techniques, such as personal interviews, administered over a period of days rather than all at once. With this said, however, participants provided information voluntarily and had the option to leave blank any question or form they felt uncomfortable answering. Thus, this limitation is not seen as particularly problematic, given that data was collected through standard protocol, as utilized by the cardiac rehabilitation program.

Finally, another limitation relates to the fact that previous non-cardiac traumas were not assessed for in the context of constructs examined. While all individuals in the present study share a cardiac history, it should be noted that we cannot rule out the effects of other potential traumas or stressors on reports of physical functioning or the overall findings.

Summary and Conclusions

In conclusion, this study provided an in-depth examination of the characteristics associated with and predictive of physical functioning in a cardiac rehabilitation sample. To the best of our knowledge, this was the first study to examine the relationships between II, IP, coping mechanisms, depression, and physical functioning together. Previous studies indicated that all of these constructs may be related, but the specific mechanisms were not clear. The present study used a regression analysis to reveal that depression was the only significant predictor of physical functioning, and that II, IP, and coping were not. The present study also used PROCESS to reveal that depression mediated the relationship between IP and physical functioning, but did not mediate the relationship between II and physical functioning. The present study failed to find evidence that coping mediated the relationship between IP and physical functioning, nor did coping mediate the relationship between II and physical functioning. The present study also revealed that IP and II were significantly related to depression, and that IP was significantly related to II. Thus, the present study suggests that II, IP, depression, and physical functioning are all related. Findings indicate that the more threatening a patient perceives an illness to be is related to the patient experiencing more depressive symptoms. The study also suggests that the more depressive symptoms a patient experiences is related to the patient experiencing a reduction in physical functioning. Findings also imply that the more threatening a patient perceives an illness to be is related to the patient experiencing invalidation from others about his or her illness. Lastly, the present study suggests that the more invalidated a patient feels in relation to his or her illness is related to the depressive symptoms the patient experiences as well. Thus, II, IP, and depression all clearly play an important functional role in the maintenance of physical functioning in a cardiac rehabilitation population.

Implications and Directions for Future Research

While all predictions of the study were not fully supported, the present study did reveal some interesting findings. First, results from the present study have better illuminated how the constructs of depression, coping, II, IP, and physical function are related. While the present study did not support the prediction that II, IP, and coping would each predict physical functioning, these results may indicate that these constructs are more closely related to physical functioning during development of disease, rather than after the patient has already entered a rehabilitation program. This is especially important for future health interventions, as findings indicate that these constructs may only be predictive of physical health before a detrimental health event even occurs. These results also indicated that not only is depression related to physical functioning as indicated in previous literature (Carney et al., 2002; Rugulies, 2002), but illuminates the interrelationships among other variables that are related to depression and physical functioning as well. IP and II were both found to be related to depression, which is related to physical functioning, and IP was related to II. This is especially important in development of future treatment plans, as focusing on not only the patient's perception of his or her illness, but how that perception may contribute to feelings of invalidation or depressive symptoms that may contribute to the patient's overall health. Additionally, it may be beneficial to include behavioral observation of the patient with his or her support system in order to objectively observe the degree of invalidation.

Given these different associations between II and IP and physical functioning, the use of strategies aimed at teasing apart causal relationships among these variables may help increase physical functioning in cardiac rehab patients. For example, working with patients' significant others and families in order to help them better understand the patient's illness and symptoms, and also educating them about how invalidation may manifest physically, as is also likely that an

individual may not understand his or her illness to the fullest extent, and thus may not be able to appropriately select an effective coping strategy (Kool, 2012; Fan et al., 2013). Lastly, future methods should also assess individuals' perception of the illness in a more in-depth manner, as perception is likely influenced by numerous factors unaccounted for in this study.

In addition to treatment related suggestions, methodological suggestions for future research are important to consider as well. It may be relevant to separate the physical functioning construct into objective health measures (BMI, heart rate, and systolic blood pressure), and the SF-36, which is a more subjective measure. It would also be important to administer only the active coping items on the Brief COPE rather than administering all items and generating an overall coping score. Additionally, it would be helpful to obtain data from a more diverse rehabilitation population in order to create a more generalizable result. It would also be ideal to collect data on patients before a cardiac trauma occurs or the patient is diagnosed with a cardiac disease, in order to determine the extent to which, if any, coping, depression, II, and IP predict the development of a cardiac trauma or cardiac disease. Lastly, future research may benefit from using a sample of all individuals diagnosed with a cardiac disease, rather than simply those who attend cardiac rehabilitation in order to achieve a more accurate representation of the population, as individuals who attend cardiac rehabilitation already have achieved a somewhat active level of coping since they are in a program designed to help them recover from and manage their disease. It would also be beneficial to make more of an effort to help patients understand the purpose of the measures so that they may be more likely to respond in a more truthful and forthright manner.

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Table 1

Summary of Intercorrelations of Physical Variables

	1	2	3
--	---	---	---

1. SF-36	---	---	---
2. Heart Rate	-0.51**	---	---
3. BMI	-0.63**	0.65*	---
4. Blood Pressure	-0.57*	0.96*	0.54*

Note: * $p < .05$, ** $p < .01$.

Table 2

Participant Demographics (N=44)

Variables	<i>n</i>	Percent
-----------	----------	---------

<i>Age</i>		
> 60	3	6.9
60 -69	16	36.3
70 - 79	19	43
80 - 89	6	13.7
<i>Gender</i>		
Male	34	77.3
Female	10	22.7
<i>Race/Ethnicity</i>		
Caucasian	44	100
<i>Marital Status</i>		
Single	2	4.5
Married	35	79.5
Divorced	5	11.4
Separated	1	2.3
Widowed	1	2.3
<i>Employment Status</i>		
Employed	12	27.3
Retired	27	61.4
Unemployed	4	9.1
Unable to Work	1	2.3
<i>Income</i>		
\$0 - \$19,999	3	6.8
\$20,000 - \$39,999	4	9.1
\$40,000 - \$59,999	6	13.6
\$60,000 - \$79,999	10	22.7
\$80,000 +	16	36.4
N/A	5	11.4

Table 2

Participant Demographics (N=44)

Variables	<i>n</i>	Percent
<i>Type of Event</i>		
Congestive Heart Failure	1	2.3
Coronary artery bypass grafting	9	20.5
Myocardial Infarction	10	22.7
Coronary stent	11	25
Valve replacement	5	11.4
Heart Bypass Surgery	1	2.3
Other	7	15.8
<i>Previous Event</i>		
No, no previous event	33	75
Yes, cardiac history	11	25
<i>Rehab history</i>		
No previous rehab	38	86.4
Yes, completed program	5	11.4
Yes, but dropped out	1	2.3

Table 3

Descriptive Statistics for All Study Variables (N = 44)

Measures	M	SD	Minimum	Maximum
COPE	4.18	1.23	2.00	6.00
CES-D	8.18	8.39	0.00	38.00
IPQ	27.61	12.05	3.00	56.00
3*I	12.61	4.18	5.00	23.00
SF-36	70.50	22.44	5.00	100.00
BMI	29.47	5.50	23.50	53.00
BP	122.81	16.26	88.00	158.00
HR	70.20	9.93	49.00	92.00

Table 4

Summary of Regression Predicted by Severity of Event

Variable	B	SE (B)	β
Depression	0.79	1.92	0.06
Coping	0.45	0.24	0.27
Invalidation	0.91	0.94	0.15
Perception	1.58	2.80	0.09
R ²		.07	
F-value		3.36*	

*Note: * $p < .05$; Event severity was separated into three categories that were used as predictors: Category 1: Other, stent; Category 2: MI, CHF; Category 3: CABG, multiple events*

Table 5

Summary of Intercorrelations of Variables

	1	2	3	4
1. Positive Coping	---	---	---	---
2. Depression	0.15	---	---	---
3. IP	0.06	0.52**	---	---
4. Invalidation	0.18	0.29	0.48**	---
5. Physical Function	-0.12	-0.47**	-0.41**	-0.30*

Note: * $p < .05$, ** $p < .01$.

Table 6

Summary of Reliability Statistics for Measures

	Cronbach's Alpha
1. Brief COPE	0.49
2. IP	0.86
3. Invalidation	0.90
2. SF-36	0.82
3. CESD-R	0.92

Table 7

Summary of Regression Analysis: Predicting for Physical Functioning

Variable	B	SE (B)	β
Depression	-0.90	0.04	-0.34*
Coping	-0.76	2.50	-0.19
Invalidation	-0.58	0.86	-0.11
Perception	-0.34	0.32	-0.19
R ²		.27	
F-value		3.68*	

Note: * $p < .05$, ** $p < .01$.

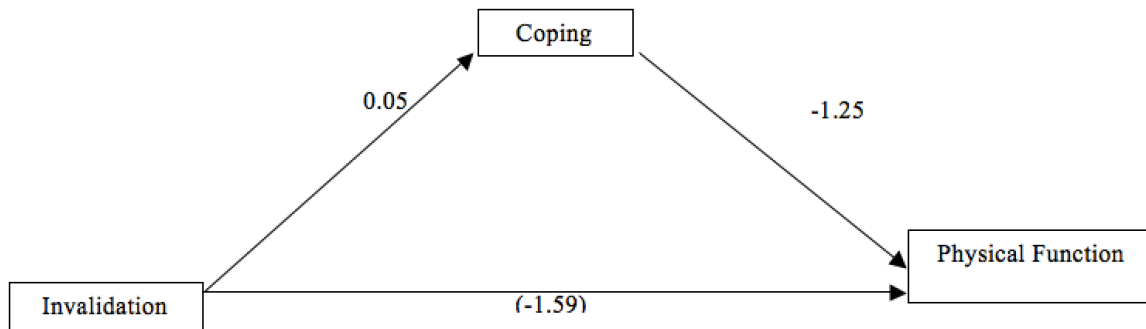
Table 8

Summary of Regression Analysis: Predicting for II

Variable	B	SE (B)	β
Perception	0.16	0.46	0.48**
R ²		0.21	
F-value		12.6**	

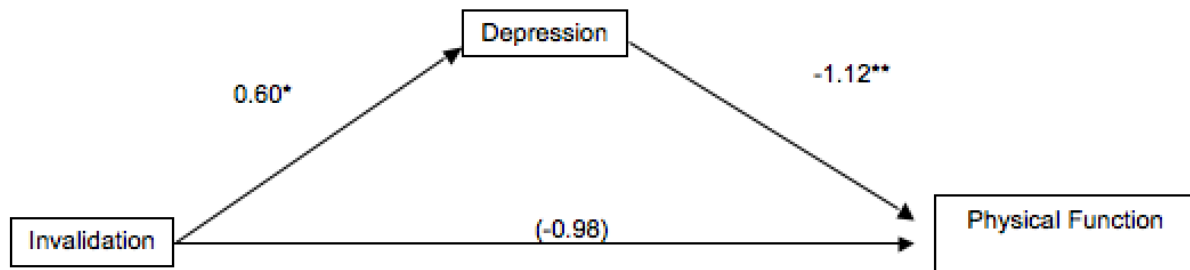
Note: * $p < .05$, ** $p < .01$.

Figure 1: Coping as a mediator of the relationship between II and physical function



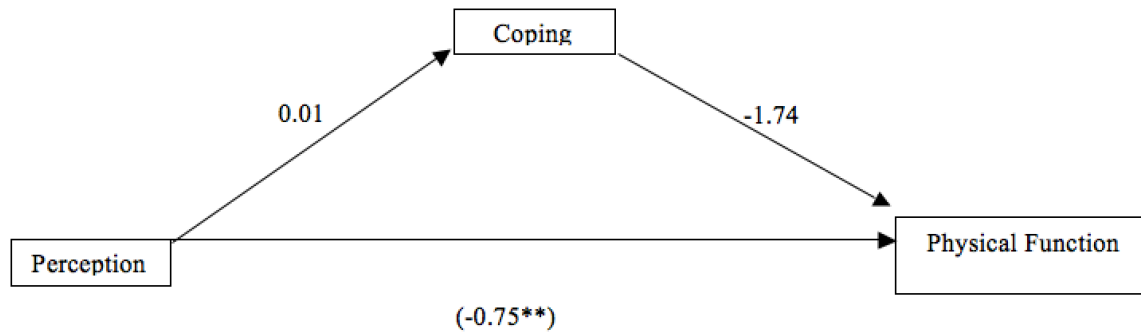
Note: * $p < .05$; ** $p < .01$. Effects of increased invalidation on physical function through the potential mediator of coping; coefficients are unstandardized estimates and the coefficient in parentheses is the total effect.

Figure 2: Depression as a mediator of the relationship between II and physical function



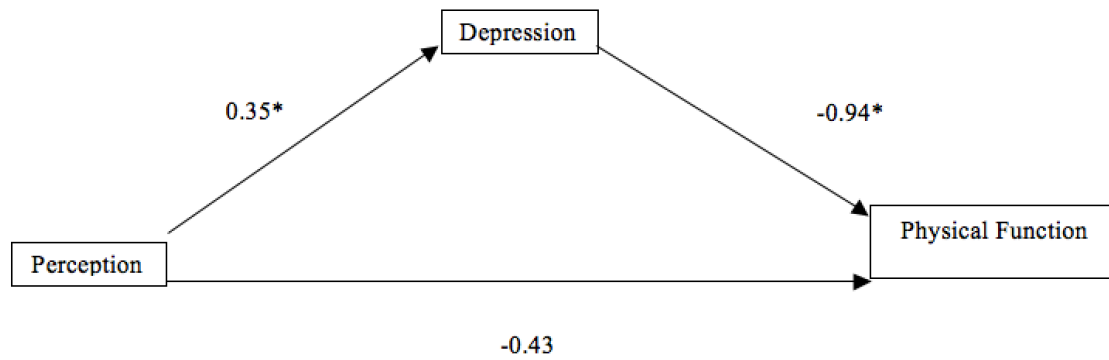
Note: * $p < .05$; ** $p < .01$. Effects of increased invalidation on physical function through the potential mediator of depression; coefficients are unstandardized estimates and the coefficient in parentheses is the total effect.

Figure 3: Coping as a mediator of the relationship between IP and physical function



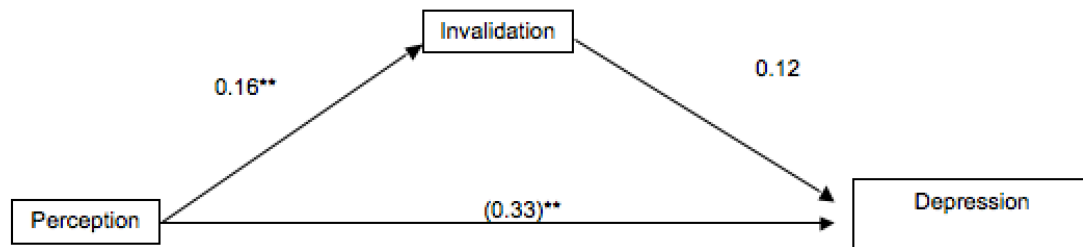
Note: * $p < .05$; ** $p < .01$. Effects of worse IP on physical function through the potential mediator of coping; coefficients are unstandardized estimates and the coefficient in parentheses is the total effect.

Figure 4: Depression as a mediator of the relationship between IP and physical function



Note: * $p < .05$; ** $p < .01$. Effects of worse IP on physical function through the potential mediator of depression; coefficients are unstandardized estimates and the coefficient in parentheses is the total effect.

Figure 5: II as a mediator of the relationship between IP and depression



Note: * $p < .05$; ** $p < .01$. Effects of worse IP on depression through the potential mediator of invalidation; coefficients are unstandardized estimates and the coefficient in parentheses is the total effect.

Appendix A

Demographics Questionnaire

Please answer the following questions to the best of your ability.

What is your gender?

Male Female

What is your race/ethnicity?

Caucasian

African American

Asian

Other

What is your current marital status?

Single

Married

Divorced

Widowed

Separated

What is your current employment status?

Employed

Unemployed

Retired

Unable to work

What is your current annual household income?

\$0 – 19,999

\$20 – 39,999

\$40 – 59,999

\$60 – 79,999

\$ 80,000+

N/A

Please describe your cardiac event that brought you to the cardiac rehabilitation program:

Have you ever attended cardiac rehabilitation in the past?

No previous rehabilitation

Yes, completed previous rehabilitation program

Yes but dropped out

Have you ever had a previous cardiac event?

No, no previous event

Yes, cardiac history

If yes, please describe:

Appendix B

SF-36 QUESTIONNAIRE

Name: _____

Ref. Dr: _____

Date: _____

ID#: _____

Age: _____

Gender: M / F

Please answer the 36 questions of the Health Survey completely, honestly, and without interruptions.

GENERAL HEALTH:

In general, would you say your health is:

☐ Excellent☐ Very Good☐ Good☐ Fair☐ Poor

Compared to one year ago, how would you rate your health in general now?

☐ Much better now than one year ago☐ Somewhat better now than one year ago☐ About the same☐ Somewhat worse now than one year ago☐ Much worse than one year ago**LIMITATIONS OF ACTIVITIES:**

The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports.

☐ Yes, Limited a lot☐ Yes, Limited a Little☐ No, Not Limited at all

Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf

☐ Yes, Limited a Lot☐ Yes, Limited a Little☐ No, Not Limited at all

Lifting or carrying groceries

☐ Yes, Limited a Lot☐ Yes, Limited a Little☐ No, Not Limited at all

Climbing several flights of stairs

☐ Yes, Limited a Lot☐ Yes, Limited a Little☐ No, Not Limited at all

Climbing one flight of stairs

☐ Yes, Limited a Lot☐ Yes, Limited a Little☐ No, Not Limited at all

Bending, kneeling, or stooping

☐ Yes, Limited a Lot☐ Yes, Limited a Little☐ No, Not Limited at all

Walking more than a mile

☐ Yes, Limited a Lot☐ Yes, Limited a Little☐ No, Not Limited at all

Walking several blocks

☐ Yes, Limited a Lot☐ Yes, Limited a Little☐ No, Not Limited at all

Walking one block

☐ Yes, Limited a Lot☐ Yes, Limited a Little☐ No, Not Limited at all

Bathing or dressing yourself

☐ Yes, Limited a Lot

☐ Yes, Limited a Little

☐ No, Not Limited at all

PHYSICAL HEALTH PROBLEMS:

During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

Cut down the amount of time you spent on work or other activities

☐ Yes

☐ No

Accomplished less than you would like

☐ Yes

☐ No

Were limited in the kind of work or other activities

☐ Yes

☐ No

Had difficulty performing the work or other activities (for example, it took extra effort)

☐ Yes

☐ No

EMOTIONAL HEALTH PROBLEMS:

During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

Cut down the amount of time you spent on work or other activities

☐ Yes

☐ No

Accomplished less than you would like

☐ Yes

☐ No

Didn't do work or other activities as carefully as usual

☐ Yes

☐ No

SOCIAL ACTIVITIES:

Emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

☐ Not at all

☐ Slightly

☐ Moderately

☐ Severe

☐ Very Severe

PAIN:

How much bodily pain have you had during the past 4 weeks?

☐ None

☐ Very Mild

☐ Mild

☐ Moderate

☐ Severe

☐ Very Severe

During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

☐ Not at all

☐ A little bit

☐ Moderately

☐ Quite a bit

☐ Extremely

ENERGY AND EMOTIONS:

These questions are about how you feel and how things have been with you during the last 4 weeks. For each question, please give the answer that comes closest to the way you have been feeling.

Did you feel full of pep?

- ☐ All of the time
- ☐ Most of the time
- ☐ A good Bit of the Time
- ☐ Some of the time
- ☐ A little bit of the time
- ☐ None of the Time

Have you been a very nervous person?

- ☐ All of the time
- ☐ Most of the time
- ☐ A good Bit of the Time
- ☐ Some of the time
- ☐ A little bit of the time
- ☐ None of the Time

Have you felt so down in the dumps that nothing could cheer you up?

- ☐ All of the time
- ☐ Most of the time
- ☐ A good Bit of the Time
- ☐ Some of the time
- ☐ A little bit of the time
- ☐ None of the Time

Have you felt calm and peaceful?

- ☐ All of the time
- ☐ Most of the time
- ☐ A good Bit of the Time
- ☐ Some of the time
- ☐ A little bit of the time
- ☐ None of the Time

Did you have a lot of energy?

- ☐ All of the time
- ☐ Most of the time
- ☐ A good Bit of the Time
- ☐ Some of the time
- ☐ A little bit of the time
- ☐ None of the Time

Have you felt downhearted and blue?

- ☐ All of the time
- ☐ Most of the time
- ☐ A good Bit of the Time
- ☐ Some of the time
- ☐ A little bit of the time
- ☐ None of the Time

Did you feel worn out?

- ☐ All of the time
- ☐ Most of the time
- ☐ A good Bit of the Time
- ☐ Some of the time
- ☐ A little bit of the time
- ☐ None of the Time

Have you been a happy person?

- ☐ All of the time
- ☐ Most of the time
- ☐ A good Bit of the Time
- ☐ Some of the time
- ☐ A little bit of the time
- ☐ None of the Time

Did you feel tired?

- ☐ All of the time
- ☐ Most of the time
- ☐ A good Bit of the Time
- ☐ Some of the time
- ☐ A little bit of the time
- ☐ None of the Time

SOCIAL ACTIVITIES:

During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)?

- ☐ All of the time
- ☐ Most of the time
- ☐ Some of the time
- ☐ A little bit of the time
- ☐ None of the Time

GENERAL HEALTH:

How true or false is each of the following statements for you?

I seem to get sick a little easier than other people

☐ Definitely true ☐ Mostly true ☐ Don't know ☐ Mostly false ☐ Definitely false

I am as healthy as anybody I know

☐ Definitely true ☐ Mostly true ☐ Don't know ☐ Mostly false ☐ Definitely false

I expect my health to get worse

☐ Definitely true ☐ Mostly true ☐ Don't know ☐ Mostly false ☐ Definitely false

My health is excellent

☐ Definitely true ☐ Mostly true ☐ Don't know ☐ Mostly false ☐ Definitely false

Appendix C

Center for Epidemiologic Studies Depression Scale – Revised (CESD-R)

Below is a list of the ways you might have felt or behaved. Please check the boxes to tell me how often you have felt this way in the past week or so.	Last Week				Nearly every day for 2 weeks
	Not at all or Less than 1 day	1 - 2 days	3 - 4 days	5 - 7 days	
My appetite was poor.	0	1	2	3	4
I could not shake off the blues.	0	1	2	3	4
I had trouble keeping my mind on what I was doing.	0	1	2	3	4
I felt depressed.	0	1	2	3	4
My sleep was restless.	0	1	2	3	4
I felt sad.	0	1	2	3	4
I could not get going.	0	1	2	3	4
Nothing made me happy.	0	1	2	3	4
I felt like a bad person.	0	1	2	3	4
I lost interest in my usual activities.	0	1	2	3	4
I slept much more than usual.	0	1	2	3	4
I felt like I was moving too slowly.	0	1	2	3	4
I felt fidgety.	0	1	2	3	4
I wished I were dead.	0	1	2	3	4
I wanted to hurt myself.	0	1	2	3	4
I was tired all the time.	0	1	2	3	4
I did not like myself.	0	1	2	3	4
I lost a lot of weight without trying to.	0	1	2	3	4
I had a lot of trouble getting to sleep.	0	1	2	3	4
I could not focus on the important things.	0	1	2	3	4

Appendix D

Brief IPQ

For the following questions, please circle the number that best corresponds to your views:

How much does your illness affect your life?	0	1	2	3	4	5	6	7	8	9	10
no affect at all											severely affects my life
How long do you think your illness will continue?	0	1	2	3	4	5	6	7	8	9	10
a very short time											forever
How much control do you feel you have over your illness?	0	1	2	3	4	5	6	7	8	9	10
absolutely no control											extreme amount of control
How much do you think your treatment can help your illness?	0	1	2	3	4	5	6	7	8	9	10
not at all											extremely helpful
How much do you experience symptoms from your illness?	0	1	2	3	4	5	6	7	8	9	10
no symptoms at all											many severe symptoms
How concerned are you about your illness?	0	1	2	3	4	5	6	7	8	9	10
not at all concerned											extremely concerned
How well do you feel you understand your illness?	0	1	2	3	4	5	6	7	8	9	10
don't understand at all											understand very clearly
How much does your illness affect you emotionally? (e.g. does it make you angry, scared, upset or depressed?)	0	1	2	3	4	5	6	7	8	9	10
not at all affected emotionally											extremely affected emotionally

Please list in rank-order the three most important factors that you believe caused your illness.

The most important causes for me:-

1. _____
2. _____
3. _____

Appendix E

Brief COPE

These items deal with ways you've been coping with the stress in your life since you found out you were going to have to have this operation. There are many ways to try to deal with problems. These items ask what you've been doing to cope with this one. Obviously, different people deal with things in different ways, but I'm interested in how you've tried to deal with it. Each item says something about a particular way of coping. I want to know to what extent you've been doing what the item says. How much or how frequently. Don't answer on the basis of whether it seems to be working or not—just whether or not you're doing it. Use these response choices. Try to rate each item separately in your mind from the others. Make your answers as true FOR YOU as you can.

- 1 = I haven't been doing this at all
- 2 = I've been doing this a little bit
- 3 = I've been doing this a medium amount
- 4 = I've been doing this a lot

1. I've been turning to work or other activities to take my mind off things.
2. I've been concentrating my efforts on doing something about the situation I'm in.
3. I've been saying to myself "this isn't real."
4. I've been using alcohol or other drugs to make myself feel better.
5. I've been getting emotional support from others.
6. I've been giving up trying to deal with it.
7. I've been taking action to try to make the situation better.
8. I've been refusing to believe that it has happened.
9. I've been saying things to let my unpleasant feelings escape.
10. I've been getting help and advice from other people.
11. I've been using alcohol or other drugs to help me get through it.
12. I've been trying to see it in a different light, to make it seem more positive.
13. I've been criticizing myself.
14. I've been trying to come up with a strategy about what to do.
15. I've been getting comfort and understanding from someone.
16. I've been giving up the attempt to cope.
17. I've been looking for something good in what is happening.
18. I've been making jokes about it.
19. I've been doing something to think about it less, such as going to movies, watching TV, reading, daydreaming, sleeping, or shopping.
20. I've been accepting the reality of the fact that it has happened.
21. I've been expressing my negative feelings.
22. I've been trying to find comfort in my religion or spiritual beliefs.
23. I've been trying to get advice or help from other people about what to do.
24. I've been learning to live with it.
25. I've been thinking hard about what steps to take.
26. I've been blaming myself for things that happened.
27. I've been praying or meditating.
28. I've been making fun of the situation.

Appendix F

Illness Invalidation Inventory

Illness Invalidation Inventory (3*I)¹

We are interested in how others react to people who have health problems or an illness. Each of the sections below refers to different people in your life. We would like you to rate **how often during the past year** each person or category of people reacted toward you in the way described. After each statement, circle the number between 1 (never) and 5 (very often) to indicate how often they reacted toward you that way.

The questionnaire has five sections, and you will rate the same reactions a number of times, but referring to different people. If a particular section does not apply to you, you may skip that part of the questionnaire and go on to the next section. Remember, rate the items with respect to how others reacted toward you **as a person who has health problems or an illness**.

Section 1: Spouse or partner

If you are single (not married, a widow/widower, or without a steady partner) then skip Section 1 and go directly to Section 2.

My spouse or partner.....	Never	Seldom	Some-times	Often	Very often
1.1finds it odd that I can do much more on some days than on other days.	1	2	3	4	5
1.2thinks I should be tougher.	1	2	3	4	5
1.3takes me seriously.	1	2	3	4	5
1.4gives me unhelpful advice.	1	2	3	4	5
1.5understands the consequences of my health problems or illness.	1	2	3	4	5
1.6makes me feel like I am an exaggerator.	1	2	3	4	5
1.7thinks I can work more than I do.	1	2	3	4	5
1.8gives me the chance to talk about what is on my mind.	1	2	3	4	5

Section 2: Family

For example, children, parents, brothers, sisters, uncles, aunts, grandparents, in-laws.

My family.....	Never	Seldom	Some- times	Often	Very often
1.1finds it odd that I can do much more on some days than on other days.	1	2	3	4	5
1.2thinks I should be tougher.	1	2	3	4	5
1.3takes me seriously.	1	2	3	4	5
1.4gives me unhelpful advice.	1	2	3	4	5
1.5understands the consequences of my health problems or illness.	1	2	3	4	5
1.6makes me feel like I am an exaggerator.	1	2	3	4	5
1.7thinks I can work more than I do.	1	2	3	4	5
1.8gives me the chance to talk about what is on my mind.	1	2	3	4	5

Section 3: Medical professionals

For example, your primary care physician, medical specialist, physical therapist, and other medical professionals. (Do not include your employer's company physician).

Medical professionals.....	Never	Seldom	Some- times	Often	Very often
1.1find it odd that I can do much more on some days than on other days.	1	2	3	4	5
1.2think I should be tougher.	1	2	3	4	5
1.3take me seriously.	1	2	3	4	5
1.4give me unhelpful advice.	1	2	3	4	5
1.5understand the consequences of my health problems or illness.	1	2	3	4	5
1.6make me feel like I am an exaggerator.	1	2	3	4	5
1.7think I can work more than I do.	1	2	3	4	5
1.8give me the chance to talk about what is on my mind.	1	2	3	4	5

Section 4: Work environment

For example, your co-workers and boss. (Do not include your employer's company physician).

If you did not have paid or unpaid employment in the past year, then skip this Section and go directly to Section 5.

People at work.....	Never	Seldom	Some-times	Often	Very often
1.1find it odd that I can do much more on some days than on other days.	1	2	3	4	5
1.2think I should be tougher.	1	2	3	4	5
1.3take me seriously.	1	2	3	4	5
1.4give me unhelpful advice.	1	2	3	4	5
1.5understand the consequences of my health problems or illness.	1	2	3	4	5
1.6make me feel like I am an exaggerator.	1	2	3	4	5
1.7think I can work more than I do.	1	2	3	4	5
1.8give me the chance to talk about what is on my mind.	1	2	3	4	5

Section 5 : Social services

For example, your employer's company physician, work-reintegration or vocational rehabilitation staff, unemployment and other government agencies, organizations for care at home, general government workers and health insurance companies.

If you did not have any interactions with these providers, you may skip this Section.

People at social services.....	Never	Seldom	Some-times	Often	Very often
1.1find it odd that I can do much more on some days than on other days.	1	2	3	4	5
1.2think I should be tougher.	1	2	3	4	5
1.3take me seriously.	1	2	3	4	5
1.4give me unhelpful advice.	1	2	3	4	5
1.5understand the consequences of my health problems or illness.	1	2	3	4	5
1.6make me feel like I am an exaggerator.	1	2	3	4	5
1.7think I can work more than I do.	1	2	3	4	5
1.8give me the chance to talk about what is on my mind.	1	2	3	4	5

Appendix G

Duke Activity Status Index

Overview:

The Duke Activity Status Index is a self-administered questionnaire that measures a patient's functional capacity. It can be used to get a rough estimate of a patient's peak oxygen uptake.

Item	Activity	Yes	No
1	Can you take care of yourself (eating dressing bathing or using the toilet)?	2.75	0
2	Can you walk indoors such as around your house?	1.75	0
3	Can you walk a block or two on level ground?	2.75	0
4	Can you climb a flight of stairs or walk up a hill?	5.50	0
5	Can you run a short distance?	8.00	0
6	Can you do light work around the house like dusting or washing dishes?	2.70	0
7	Can you do moderate work around the house like vacuuming sweeping floors or carrying in groceries?	3.50	0
8	Can you do heavy work around the house like scrubbing floors or lifting and moving heavy furniture?	8.00	0
9	Can you do yardwork like raking leaves weeding or pushing a power mower?	4.50	0
10	Can you have sexual relations?	5.25	0
11	Can you participate in moderate recreational activities like golf bowling dancing doubles tennis or throwing a baseball or football?	6.00	0
12	Can you participate in strenuous sports like swimming singles tennis football basketball or skiing?	7.50	0

Appendix H

State Trait Anxiety Inventory form Y-2

SELF-EVALUATION QUESTIONNAIRE

STAI Form Y-2

Name _____ Date _____

DIRECTIONS

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

ALMOST NEVER
SOMETIMES
OFTEN
ALMOST ALWAYS

- | | | | | |
|--|---|---|---|---|
| 21. I feel pleasant..... | 1 | 2 | 3 | 4 |
| 22. I feel nervous and restless | 1 | 2 | 3 | 4 |
| 23. I feel satisfied with myself..... | 1 | 2 | 3 | 4 |
| 24. I wish I could be as happy as others seem to be | 1 | 2 | 3 | 4 |
| 25. I feel like a failure | 1 | 2 | 3 | 4 |
| 26. I feel rested | 1 | 2 | 3 | 4 |
| 27. I am "calm, cool, and collected"..... | 1 | 2 | 3 | 4 |
| 28. I feel that difficulties are piling up so that I cannot overcome them..... | 1 | 2 | 3 | 4 |
| 29. I worry too much over something that really doesn't matter..... | 1 | 2 | 3 | 4 |
| 30. I am happy | 1 | 2 | 3 | 4 |
| 31. I have disturbing thoughts | 1 | 2 | 3 | 4 |
| 32. I lack self-confidence..... | 1 | 2 | 3 | 4 |
| 33. I feel secure | 1 | 2 | 3 | 4 |
| 34. I make decisions easily | 1 | 2 | 3 | 4 |
| 35. I feel inadequate..... | 1 | 2 | 3 | 4 |
| 36. I am content | 1 | 2 | 3 | 4 |
| 37. Some unimportant thought runs through my mind and bothers me | 1 | 2 | 3 | 4 |
| 38. I take disappointments so keenly that I can't put them out of my mind | 1 | 2 | 3 | 4 |
| 39. I am a steady person..... | 1 | 2 | 3 | 4 |
| 40. I get in a state of tension or turmoil as I think over my recent concerns
and interests | 1 | 2 | 3 | 4 |